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Venermo, Maarit

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## INVITED COMMENTARY

## Nonagenarians will be the Future Challenge for Vascular Specialists

Maarit Venermo

Helsinki University Hospital and University of Helsinki, Finland

In the 1970s the most common treatment for chronic limb-threatening ischemia (CLTI) was major amputation. In the 1980s bypass techniques developed and increased by number. This led to the development of the vascular surgical specialty. During the 1990s, the development of endovascular techniques replaced aortoiliac open surgery for lower limb arterial disease (LEAD), and over the last 10 years, an endovascular “tsunami” has spread to all levels of the lower extremity arteries (Fig. S1; see Supplementary Material). At the same time, patient demographics have changed. Forty years ago, the most common risk factor was smoking, while 20 years ago patients were predominantly both smokers and diabetics. Thereafter, smoking has decreased, but a third group of patients has emerged. This group comprises those who have been relatively healthy all their lives, with no serious risk factors, and who are now approaching their 100th birthday: patients over 90 years of age. These patients live at home and are mentally sound but, during their long life, have developed universal atherosclerosis and, eventually, CLTI. This group will grow markedly in the future.

In light of this, Fridh *et al.* write about an important topic in their population-based observational cohort study on 11 000 patients from Swedvasc operated on in Sweden from 2008 to 2013.<sup>1</sup> Outcome information was scrutinized using mandatory national registers and case histories. Mean patient age was 77 years, and the age range demonstrates clearly the heterogeneity of patients: the youngest were 50 years of age (most likely, younger patients were treated, but those aged < 50 years were excluded), whereas the oldest patient was 103 years of age. Male sex, renal insufficiency, diabetes, heart failure, and atrial fibrillation were independently associated with both increased amputation risk and combined amputation or death, whereas the use of low-dose acetylsalicylic acid (ASA) and statins decreased significantly the risk of these end points. As numerous studies have been published on the risk factors for complications after lower extremity revascularization, there are few findings here that are worth underlining. First, the use of low-dose ASA and statins was clearly protective. However, the rate of statin use was disappointing, only 64%. Also, the risk of negative end points was not higher in women, but was, after adjusting for age, in men. Furthermore, the combination of renal insufficiency, diabetes, and heart failure resulted in an almost threefold increase in the risk of amputation and an almost fourfold increase in the risk of amputation or death, and

the authors conclude that this may guide vascular specialists in the risk/benefit assessment. Indeed, it may guide us, but this study does not provide a concrete tool or even clear instructions for the patient selection. It is much easier to predict patients with an excellent outcome than those who will not benefit from surgery. As the material is extensive, there could have been enough patients to test or develop a scoring method for everyday use to help vascular surgeons in decision-making.

At its best, revascularization helps to prevent amputation for decades and enables independent living at home rather than in an institution. It may also be harmful if patient selection is inapt.<sup>2</sup> In the future, we will encounter an increasing number of very old individuals with CLTI and make decisions regarding their revascularizations. How are we to distinguish the patients who will not benefit from revascularization but rather will have a worse outcome due to the procedure? Patients who do not recover from revascularization may not return home. Patients on whom we use a lot of resources by attempting several revascularizations may end up needing an amputation or die. I hope we will have the courage to study this area and develop guidelines for the future. As it is now, the guideline is that if a patient is not living at home, is not mobile, and has dementia, revascularization is not beneficial. Moreover, among elderly patients, an endovascular-first or even endovascular-only approach may be acceptable.<sup>3</sup>

In the end, we should be more aggressive with preventive medication. Patients need more information on statins. The benefit has been proven at every turn, yet even in the Swedish study the rate of statin use was not high.

## APPENDIX A. SUPPLEMENTARY DATA

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ejvs.2018.08.056>.

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E-mail address: [maarit.venermo@hus.fi](mailto:maarit.venermo@hus.fi) (Maarit Venermo).

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